Avalon CTS

Cordless Fetal Transducer System

Features

The Avalon CTS Cordless Fetal Transducer System measures and transmits standard fetal parameters to a compatible fetal monitor using radio transmission (RF) technology, thus eliminating transducer cables.

It is designed for use in the antepartum period and during labor and delivery.

The Avalon CTS combines maximum convenience and versatility with ease of use.

It offers:

- Cordless, waterproof, light-weight transducers, that are easy to clean
- Higher clinical confidence, by allowing expectant mothers to be continuously monitored, whether in the bath or shower, in the bed, or while ambulating
- Increased comfort, convenience and flexibility for patients with normal labor and deliveries
- Reliable parameter signal quality, with a line-of-sight operating range of up to 100m/300 ft[1] using the standard antenna[2]
- High capacity, rechargeable Lithium-Ion batteries, combining an operating time of more than 16 hours per charge cycle with a short recharge time of less than 3 hours
- Smart battery management ensures rapid "top-up" charging at any time, even when the base station is in stand-by, without the memory effects typically associated with Ni-Cd batteries
- Color-coded transducers and docking slots making placement of transducers easy
- Intelligent, flexible channel management for automatic radio frequency allocation, ensuring optimum use of the radio frequency band and allowing transducer exchange between different base stations
- Connects to any fetal sensor socket on the Philips Avalon FM20 and FM30 fetal monitors[3] via dedicated interface cable
- Interface to the Series 50 family of fetal monitors from Philips, Agilent and Hewlett-Packard

1. The effective operating range can vary depending on the geographical and constructional characteristics of the building where the system is installed, and whether underwater monitoring is performed.
2. There may be circumstances where you need to connect the Avalon CTS to an antenna system. Contact Philips Support regarding site preparation, antenna system design and assistance with your specific requirements.
3. Requires Avalon FM20/FM30 interface cable M2731-60001, and monitor software revision D.00.00 or higher.

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Description

The Avalon CTS consists of a base station and the following transducers:

- Cordless US transducer measures fetal heart rate* and fetal movement profile
- Cordless Toco transducer measures uterine activity externally
- Cordless ECG transducer measures either DECG* or MECG.

*Only one fetal heart rate can be measured at a time, using either ultrasound or DECG.

The transducers are powered by rechargeable batteries. These are charged when the transducers are docked in a base station connected to AC power.

Radio Frequency Transmission

The Avalon CTS consists of transducers that convert measurements to radio signals and send them to the base station which processes the signals for input to the fetal monitor.

The transducers have programmable radio frequency (RF) generators, operating within the country specific frequency range.

There are two operating modes for the base station: automatic channel allocation, and configurable fixed frequency.

Transmission frequency range: 10 MHz hardware RF tuning range.

The exact frequency range covered is country specific, using only a section of the entire hardware frequency range, and the starting point of the tuning range depends on the selected country option. Be sure to comply with any local regulations regarding approved frequencies, and contact Philips for assistance with your specific requirements.

Frequency Ranges	
Country/Country Group	**Hardware RF Tuning Range (MHz)**
Japan	420 - 430
Most European Countries (covers Industrial, Scientific and Medical (ISM) band)	433 - 443
USA, Canada, Australia (covers Wireless Medical Telemetry Service (WMTS) band)	608 - 618

Displays

Base station

The base station has the following displays and indicators:

- a two-digit numeric LED display showing
  - the unique base station ID (the Bed Label)
  - configuration settings
  - error codes
- a speaker on/off symbol showing whether the acoustic alert is on or off

Docking slots

Each transducer docking slot has three backlit indicators showing:

- when a transducer is ready for use
- status information about the transmission link between the transducer and base station
- when there is an error condition

Transducer

Each transducer has an LCD display showing:

- a bed symbol and an associated two-digit numeric bed label
- a battery capacity status symbol with three elements
- a warning symbol to indicate incorrect use or technical problems
- the transducer slot position indicator

Alerting

Alerts are available for loss of RF signal and low battery capacity.

Connectors

- BNC antenna connector
- Female D-sub25 monitor interface
- Earth ground pin IEC 320 male power connector
- 3.5mm stereo plug service connector
- Power inlet

Safety Features

- Optical and acoustic advance alert one hour before battery is empty
- Unique transducer ID code to prevent the base station from accepting the wrong signal
- Automatic resume after power failure

Interface Capabilities

Avalon FM20/FM30 Fetal Monitors

The Avalon CTS interfaces to the Avalon family[4] of fetal monitors via the Avalon FM20/FM30 interface cable (M2731-60001). The cable connects to any of the four fetal sensor sockets on the monitor.

Series 50 Fetal Monitors

US and Toco parameters interface to all Series 50 fetal monitors. Cordless DECG interfaces with M1350A/B/C and M1353A. Cordless MECG can only be measured by M1350A/B/C.

M1350B/C with Tele/System Interface M1350-66536 (supports FMP measurements).

4. Requires Avalon FM20/FM30 monitor software revision D.00.00 or higher.

M1350A[5] with Tele/System Interface M1350-66536 or Telemetry Interface M1350-66531.
FMP measurements only possible with M1350-66536.

M1351A[5] with Combined Interface Module M1353-66531E. FMP measurements possible only with board Rev. E and higher (Option J10, J13 or J14).

M1353A[5] with Combined Interface Module M1353-66531E. FMP measurements possible only with board Rev. E and higher (Option J10, J13 or J14).

Standards Compliance

Federal Law in the USA restricts this device to use by or on the order of a physician.

The Avalon CTS complies with the essential requirements of the Medical Devices Directive (93/42/EEC) and the Radio and Telecommunications Terminal Equipment Directive (1999/5/EC), and with the following standards:

5. Telemetry interface upgrade available.

Safety, Performance

- EN 60601-1:1990+A1:1993+A2:1995 (IEC 60601-1:1988+ A1:1991+A2:1995)
- EN 60601-1-1:2001 (IEC 60601-1-1:2000)
- EN/IEC 60601-2-37:2001
- EN/IEC 60601-2-49:2001
- EN 60601-1-4:1996
- UL2601-1
- CAN/CSA C22.2#601.1-M90
- JIS T 1001-1992
- JIS T 1002-1992
- AS 3200.1.0-1998

Electromagnetic Compatibility

- EN/IEC 60601-1-2:2001
- FCC 47 CFR Part 15 Subpart B
- ICES-001:1988

M2720A is classified as electromagnetic emissions Class B.

Radio

- EN 300 220-3:2000, EN 300 220-1:2000
- FCC 47 CFR Part 15 Subpart C and Part 95 (WMTS)
- RSS-210

IEEE C95.1-1999

Environmental Specifications

The monitor may not meet the given performance specifications if stored and used outside the specified temperature and humidity ranges.

Environmental Specifications (Transducers and Base Station)		
Temperature Range	Charging	0°C to 45°C (32°F to 113°F)
	Operating	0°C to 45°C (32°F to 113°F)
	Storage (without battery)	-20°C to +60°C (-4°F to 158°F)
	Storage with battery	Depends on initial charge level and temperature (storage time decreases significantly at high (> 45°C/113°F) temperatures
Humidity Range	Operating	5% to 95% relative humidity @ 40°C/104°F
	Storage	5% to 85% relative humidity @ 50°C/122°F
Altitude Range	Operating	≤ 3000 m/9800 ft.
	Storage	≤ 15000 m/49000 ft.

Base Station Specifications

Base Station Specifications		
Power	Supply Voltages	100 VAC to 240 VAC ± 10%
	Supply Frequency Range	50 Hz to 60 Hz
	Consumption	15 VA
Dimensions and Weight	Size mm/(in): width x depth x height	350 x 240 x 75 (13.8 x 9.5 x 3.0 in)
	Weight	2.5 kg/5.5 lbs without transducers
Type of Protection Against Electrical Shock	Class I equipment	
Input Sensitivity	Input Sensitivity	-110 dBm @ 30 dB Signal-to-Noise Ratio
Image Rejection	Image Rejection	> 80 dB
Operating Range	Receiving Range (line of sight)	approximately 100 m/300 ft.[a]
Antenna	Input Impedance	50 Ω
Water Ingress Protection Code	IP X1 (protection only against vertically falling water drops)	

a. The effective operating range can vary depending on the geographical and constructional characteristics of the building where the system is installed, and whether underwater monitoring is performed.

Transducer Specifications

Transducer Specifications		
General		
Dimensions and Weight	Size (diameter)	< 10 cm/3.94 in
	Weight	< 140 g/4.8 oz.
Battery	Type	Lithium Ion
	Capacity	> 16 hours
	Life	> 500 charge/discharge cycles (with new battery, at 25°C/77°F)
	Transducer Storage Time (depends on initial battery charge level and temperature. Storage time is shortened significantly by high temperatures)	≥ 1 year at 25°C/77°F (battery full)
		≥ 1 month at 25°C/77°F (battery empty)
	Recharging Time	100% charged ≤ 2,5 h
		66% charged ≤ 1 h
Degree of Protection Against Electrical Shock	For US, ECG (DECG/MECG), and Toco parameters. Transducers are battery operated.	Type CF
Water Ingress Protection Code	IP 68 (0.5m immersion for 5 hours)	
Usability Underwater	0.5m	
Shock Resistance	Withstands a 1m drop to concrete surface with possible cosmetic damage	
RF Unit		
Nominal RF Output Power	0.1 mW ERP (typical)	
Channel spacing	25 kHz (12.5 kHz Japan)	
Data rate	200 bits/s	
Modulation type	Analog	frequency modulation
	Digital	FSK 1.6 kHz and 2.4 kHz

Performance Specifications

Frontends			
US	US Intensity	Average output power	P = (3.3 ± 0.4) mW
		Peak-negative acoustic pressure	p_- = (27.4 ± 4.6) kPa
		Output beam intensity (I_{ob}) (= spatial average - temporal average intensity)	I_{sata} = (2.64 ± 0.83) mW/cm²
		Spatial-peak temporal average intensity	I_{spta} = (7.0 ± 2.3) mW/cm²
		Effective radiating area @ -6 dB	1.25 cm²
	US Frequency		1 MHz
TOCO	Signal Range		0 to 127 units
	Measurement Range		-100 to 300 units
	Resolution		0.25 units
	Baseline Drift due to Temperature Changes		1 unit/min/°C (free air)
	(When monitoring patients under water, Toco baseline drift may be higher than usual and require frequent manual adjustment of the baseline.)		5 units/min/°C (underwater)
ECG	Type		Two Lead ECG
	Input Impedance		> 10MΩ @ 35 Hz
	Input Voltage Range ECG		20 µVpp to 4 mVpp (66dB)

Ordering Guide and Accessory Options

You can order the Avalon CTS Cordless fetal Transducer System under the product number **M2720A**. To order, precede the required option number with M2720A (for example, you would order a base station together with one Toco and one US transducer using M2720A #A02). "K" options let you modify your order. Below you will find tables giving you a quick overview of the various options. Refer to "Standard Accessories Included" on page 5 for a list of items shipped as part of the standard configuration.

Order upgrade options by using the prefix **M2720AU**.

System Hardware Components

System Hardware Components	Product Number
Base Station	**M2720A**
Cordless Toco Transducer	**M2725A**
Cordless Ultrasound Transducer	**M2726A**
Cordless ECG Transducer	**M2727A**
Antenna	-
Mounting brackets	-

M2720A System Hardware Configuration Options

The system comes in three possible configurations to match individual requirements.

M2720A Options	
Option No.	**Description**
A01	Base station
A02	Base station including 1 Toco and 1 US transducer, 2 belts, and 1 bottle of US gel
A03	Base station including 1 Toco, 1 US and 1 ECG transducer, 3 belts, and 1 bottle of US gel

M2720A Modification Options

M2720A Modification Options	
Option No.	**Description**
K01	Antenna Extension Kit (see "Antenna Extension Kit" on page 6)
K30	Avalon FM20/FM30 interface cable M2731-60001, for connection to Avalon series fetal monitors (monitor requires software revision D.00.00 or higher)
K50	Series 50 interface cable

Additional Transducers

Additional Transducers	
Part No.	**Description**
M2725A	Cordless Toco transducer
M2726A	Cordless US transducer
M2727A	Cordless ECG transducer

Standard Accessories Included

The following accessories are supplied with the Avalon CTS:

Standard Accessories	Quantity
Antenna with rectangular BNC connector	1
Power cable	1
Service cable (PC Interface cable for Service Support Tool (M1360-61675))	1
Instructions for Use	1

Standard Accessories	Quantity
Documentation DVD-ROM *(*including *Instructions for Use*, *Service Guide*, and *Service Support Tool*)	1
Training Video (region-free DVD, English only, available in selected geographies)	1

System Accessories and Supplies

Accessory		Order Number
Belts (contain latex)		M1562A
Waterproof Belts		M1562B
Disposable abdominal belts (case of 100)		M2208A
Ultrasound gel		40404-001
DECG Accessories: New Philips DECG Solution	DECG reusable legplate adapter cable (with flushing port)	9898 031 37651
	DECG leg attachment electrode for DECG legplate adapter cable	9898 031 39771
	DECG fetal scalp electrode: single spiral, worldwide availability	9898 031 37631
	DECG fetal scalp electrode: double spiral, Europe only. Not for USA	9898 031 37641
DECG Accessories: QwikConnect Plus™ Solution	DECG reusable legplate adapter cable (QwikConnect Plus™)	M1362B
	DECG leg attachment electrode for DECG legplate adapter cable	M1349A
	DECG fetal scalp electrode: single spiral, worldwide availability	15133E
	DECG fetal scalp electrode: double spiral, Europe only. Not for USA	15133D
MECG adapter cable		M1363A
MECG electrodes		40493E
ECG/AUX Transducer		M2727A
Telemetry interface cable	For connection to Avalon fetal monitors (cable part number: M2731-60001)	M2731-60501
	For connection to Series 50 fetal monitors	M2720-61603
Antenna: all bands		0950-2028
Rectangular BNC connector		1250-0076
Battery exchange kit		M2720-64001
Transducer ventilation knob kit		M2720-64002

Upgrade Options

Upgrade Options		
Product	**Option No.**	**Description**
M2720AU	**K01**	Antenna Extension Kit (see “Antenna Extension Kit” on page 6)
M2720AU	**K30**	Avalon FM20/FM30 interface cable M2731-60001, for connection to Avalon series fetal monitors (monitor requires software revision D.00.00 or higher)
M2720AU	**K50**	Series 50 interface cable
M2720AU	**U01**	Mounting Kit for Series 50 CL Cart
M2740A	**U01**	Mounting Kit for Avalon FM20/FM30 Cart

Antenna Extension Kit

Antenna Extension Kit	
Kit Contents	**Description**
Antenna extension cable with BNC connectors (1.0 m).	For use with carts or other mounting solutions where the standard antenna cannot be attached directly to the base station, or does not provide sufficient transmission range.
Mounting bracket including fixings.	
Antenna holder, with screws to attach to mounting bracket. Can also be fitted on walls or other flat surfaces.	

Mounting Solutions

There are several ways to mount the Avalon CTS:

- On a dedicated mounting shelf, available for Avalon FM Cart and Series 50 CL Cart (see “Upgrade Options” on page 6)
- On top of Series 50 IX/XM/XMO fetal monitors using mounting brackets
- In a standard cart drawer - base station with docked transducers fits into Cart CL, CX, CM (requires Antenna Extension Mounting Kit)
- On top of carts or desks
- GCX mounting adapter for mounting the base station in a wide variety of situations (order directly from GCX, part number PH-0042-80)

Avalon FM20/FM30 Cart with Avalon CTS mounting kit

Avalon CTS mounted on top of a Series 50 XM monitor

Installation Considerations

Delivery Configuration		**Special Installation Considerations**
Country	**Description**	
Australia, Austria, Bahrain, Belgium, Canada, Croatia, Czech Republic, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, India, Ireland, Israel, Italy, Jordan, Kazakhstan, Latvia, Lebanon, Lithuania, Luxembourg, Netherlands, New Zealand, Poland, Portugal, Romania, Russia, Saudi Arabia, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, Taiwan, Thailand, Tunisia, Turkey, United Arab Emirates, United Kingdom, USA, Venezuela	In its default delivery configuration, the Avalon CTS is customer installable, and delivered with automatic frequency allocation and a standard antenna, giving a potential operating range of up to 100m/300ft.	The default delivery configuration may be unsuitable under certain circumstances, for instance: • you need to set fixed frequencies when there are other telemetry systems installed in the same institution (always applies to Japan). The configuration should be carried out either by the hospital’s biomedical department, or by Philips Support. • you need to connect the Avalon CTS to an antenna system because the standard antenna is not sufficient to cover the area intended for cordless monitoring. Contact Philips Support regarding site preparation, antenna system design and assistance with your specific requirements.
Japan	As above, except that the Avalon CTS uses fixed frequencies as the default system configuration.	
Norway, Singapore and All Others	For availability, contact your local Philips Medical sales representative. The method of installation may vary according to country-specific requirements. Contact Philips Support for assistance.	

Antenna System Guidelines

- Avalon CTS is compatible with the M2600-series dual band antenna system components.
- The same site preparation and antenna system design rules for the Philips M2600A adult telemetry system should be used for the Avalon CTS. Existing antenna systems used for M1310A fetal telemetry may not comply and may need to be redesigned to work with the Avalon CTS. For further details, contact Philips Support.
- Avalon CTS systems can share an antenna system with other telemetry devices, such as M1310A or M2600A. Note that frequency converters used with M2600A adult telemetry **cannot** be used with the Avalon CTS. For further details, contact Philips Support.

Contact Philips Support regarding site preparation, antenna system design and assistance with your specific requirements.

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